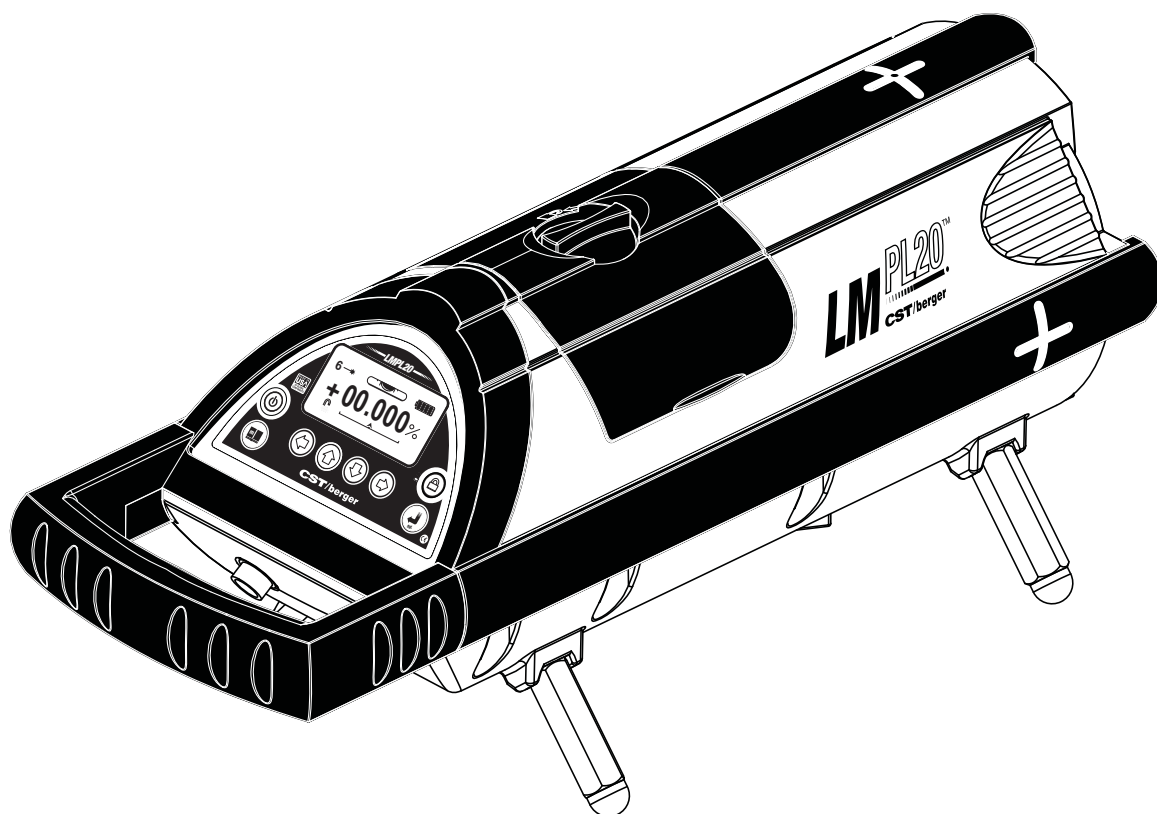


INSTRUCTION MANUAL

Electronic Self-Leveling LMPL20 Pipe Laser



Model
59-LMPL20



CST/berger

Fig. 1

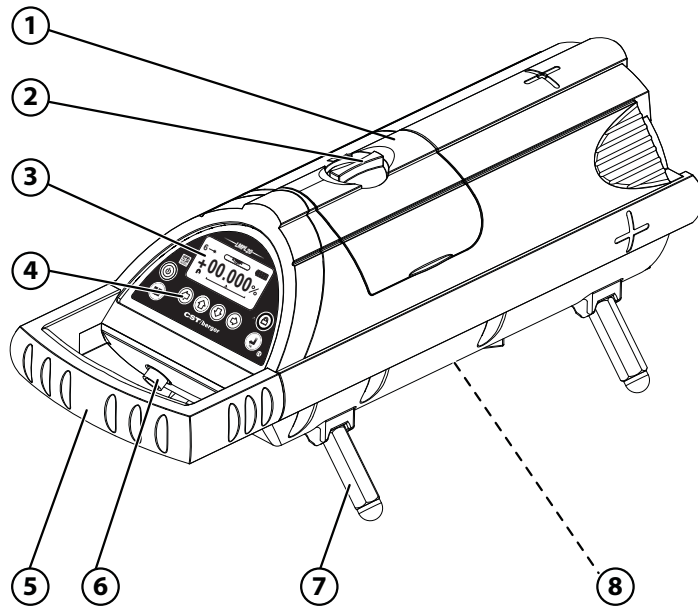


Fig. 2

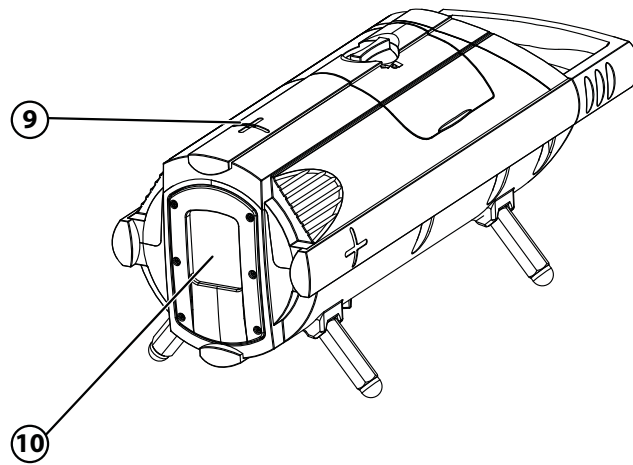


Fig. 3

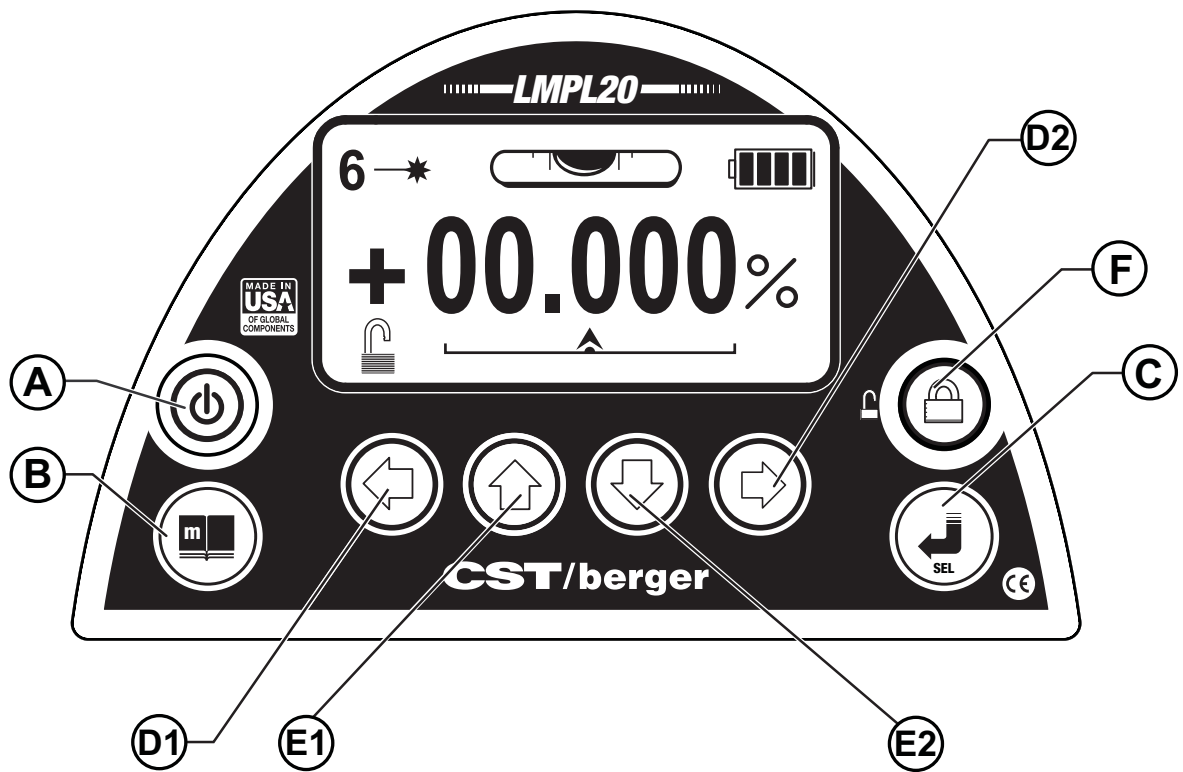


Fig. 4

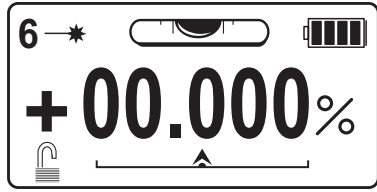


Fig. 8

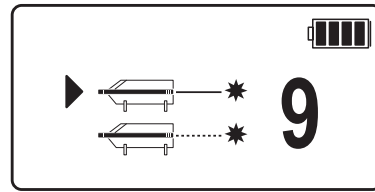


Fig. 5

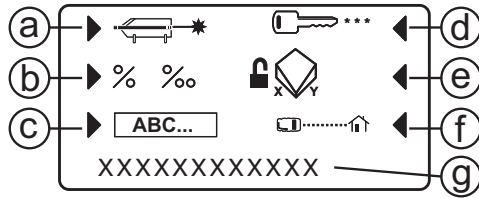


Fig. 9



Fig. 6

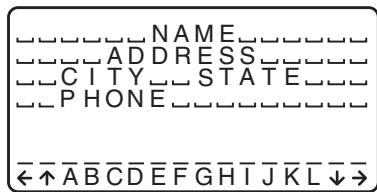


Fig. 10



Fig. 7

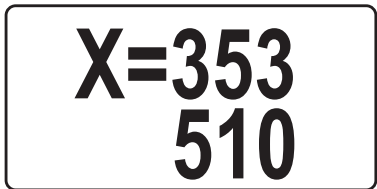


Fig. 11

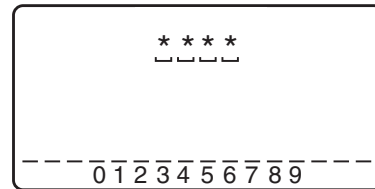


Fig. 12



Fig. 13

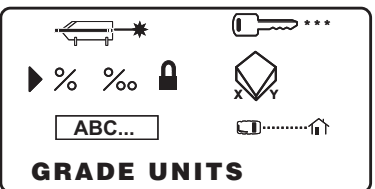


Fig. 14

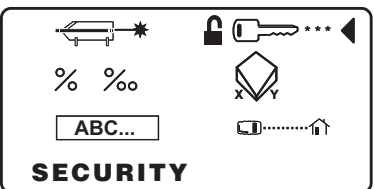


Fig. 15

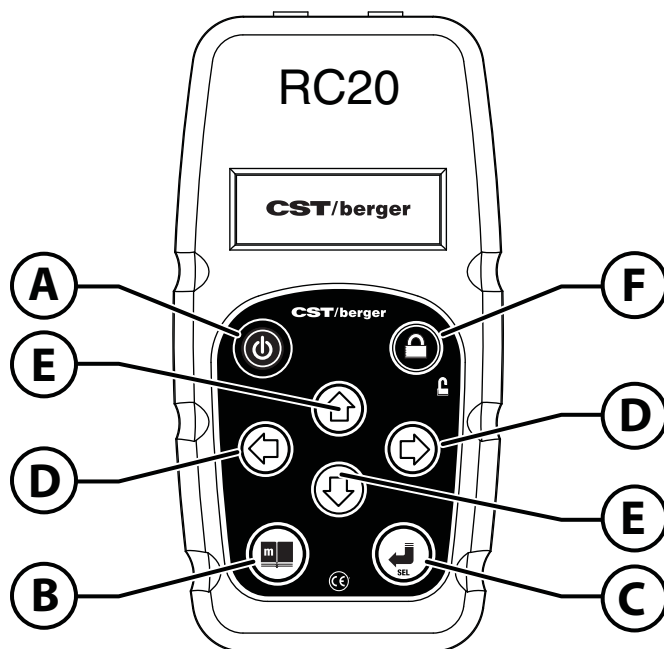


Fig. 16

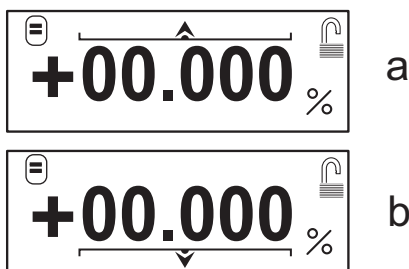


Fig. 17

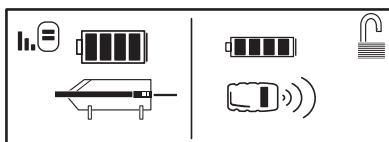


Fig. 18

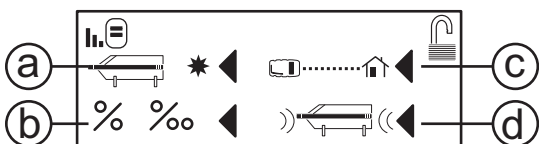


Fig. 19

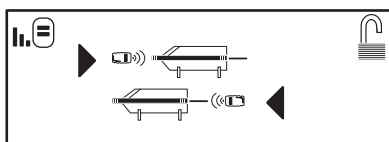


Fig. 20



Fig. 21

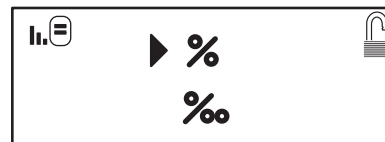
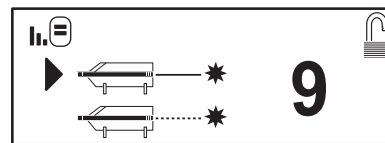


Fig. 22





Thank you for purchasing the CST/Berger LMPL20 Electronic Self-Leveling Pipe Laser level. The **LMPL20** pipe laser tool has many unique features such as a High Powered Red laser beam, which makes accurately locating the center of the beam easy. The Unique High Powered Red Laser beam also increases the visibility of the laser over long distances- inside or outside the pipe.

Note: Please read this manual thoroughly before operation

MODEL

59-LMPL20






Pipe Laser, 12 VDC Ext. Power Cable, NiMH Battery Charger, NiMH Battery Pack, Alkaline Battery Pack, Small Target, Large Target, Target Holder, Carrying Case, Leg Set, Remote Control RC20, Instruction Manual, Warranty Card.

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SAFE OPERATING PROCEDURES

-  **CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure
-  **WARNING:** Be sure to read and understand all instructions in this manual before using this product.
-  Failure to follow all instructions may result in hazardous radiation exposure, electric shock, fire, and/or bodily injury.
-  **CAUTION:** Use of controls or adjustments or performance of procedures other than those specified in this manual, may result in hazardous radiation exposure.
-  **CAUTION:** The use of optical instruments with this product will increase eye hazard.

IMPORTANT: The following labels are on your LMPL20 for your convenience and safety. They indicate where the laser light is emitted by the level. ALWAYS BE AWARE of their location when using the level.



ALWAYS make sure that any bystanders in the vicinity of use are made aware of the dangers of looking directly into the pipe laser tool .

DO NOT remove or deface any warning or caution labels. Removing labels increases the risk of exposure to laser radiation.

DO NOT stare directly at the laser beam or project the laser beam directly into the eyes of others. Serious eye injury could result.

DO NOT place the pipe laser tool in a position that may cause anyone to stare into the laser beam intentionally or unintentionally. Serious eye injury could result.

DO NOT use any optical instruments such as, but not limited to, telescopes or transits to view the laser beam. Serious eye injury could result.

ALWAYS remove the batteries when cleaning the laser light aperture or laser lens.

DO NOT operate the pipe laser tool around children or allow children to operate the pipe laser tool . Serious eye injury could result.

ALWAYS turn the pipe laser tool "OFF" when not in use. Leaving the pipe laser tool "ON" increases the risk of someone inadvertently staring into the laser beam.

DO NOT operate the pipe laser tool in combustible areas such as in the presence of flammable liquids, gases or dust. **ALWAYS** position the pipe laser tool securely. Damage to the pipe laser tool and/or serious injury to the user could result if the pipe laser tool falls.

ALWAYS use only the accessories that are recommended by the manufacturer of your pipe laser tool. Use of accessories that have been designed for use with other pipe laser tools could result in serious injury.


DO NOT use this pipe laser tool for any purpose other than those outlined in this manual. This could result in serious injury.

DO NOT leave pipe laser tool "ON" unattended in any operating mode.

ALWAYS repair and servicing must be performed by a qualified repair facility. Repairs performed by unqualified personnel could result in serious injury.

DO NOT disassemble the pipe laser tool. There are no user serviceable parts inside. Disassembling the laser will void all warranties on the product. Do not modify the product in any way. Modifying the pipe laser tool may result in hazardous laser radiation exposure.

ELECTRICAL SAFETY PROCEDURES

 **WARNING:** Batteries can explode or leak, and can cause injury or fire. To reduce this risk: **ALWAYS** follow all instructions and warnings on the battery label and package.

DO NOT short any battery terminals.

DO NOT charge alkaline batteries.

DO NOT mix old and new batteries. Replace all of them at the same time with new batteries of the same brand and type.

DO NOT mix battery chemistries.

DISPOSE of batteries per local code.

DO NOT dispose of batteries in fire.

KEEP batteries out of reach of children.

REMOVE batteries if the device will not be used for several months.



CERTIFICATIONS

This laser complies with all applicable portions of title 21 of the Code of Federal Regulations set by the Food and Drug Administrations, Center for Devices, and Radiological Health. Complies with 21CFR 1040.10 and 10040.11 except for deviations pursuant to Laser notice No. 50, dated June 24, 2007.

This LMPL20 has also been tested and complies with the CE certification requirements set forth in the EC regulations 89/336/EEC and EN 61000-6-1 (EN50082-1), EN 61000-6-3 (EN50081-1) and EN 60825-1.

LMPL20

Contains FCC ID: MCQ-XBEEPR02

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Contains Model XBee-PRO Radio, IC: 1846A-XBEEPR02
ID: 005NYCA0378

RC20

Contains FCC ID: TXT - F034K69P01

The enclosed device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (i.) this device may not cause harmful interference and (ii.) this device must accept any interference received, including interference that may cause undesired operation.

Contains Model XBee-PRO Radio, IC: 909G-F034K69P01
ID: 005NYCA0378

ENVIRONMENT PROTECTION

Recycle raw materials & batteries instead of disposing of waste. The unit, accessories, packaging & used batteries should be sorted for environmentally friendly recycling in accordance with the your countries latest regulations.



FEATURES Fig. 1 & 2

1. Battery pack
2. Battery pack knob
3. LCD Display
4. Operating keys
5. Handle
6. External 12V Port
7. Interchangeable legs
8. 5/8 -11 Tripod mount
9. Laser centerline/ Plumb LED
10. Laser beam window

Reference
in text

A



ICONS

Power key- Turn the instrument ON or OFF
(Remote: power button only powers on Remote and used to turn on and off sleep mode)

B



Menu key- Press to show menu options.

C



Enter key- Press to set grade entries and to make selections from menu screen.

D



Line control left and right- Press to position laser beam to left, right, or auto center.
Menu scroll key- Used to scroll through menu options.

E



Grade up or down- Press to position grade up or down, or auto zero grade
Menu scroll key- Used to scroll through menu options.

F



Lock key- Press to prevent changes after setup.

IMPORTANT

The owner/operator of the LMPL20 Pipe Laser is expected to follow all operation instructions, periodically check the accuracy of the instrument, and make checks on line and grade as the work progresses. The manufacturer, its distributors, or its agents assume no responsibility for improperly laid pipe.

OPERATION

Leveling

Place the LMPL20 so it appears level on a flat surface, inside a pipe, on top of a pipe, secured to a 5/8"-11 mounting bracket, or to a 5/8"-11 surveyors tripod. Press and release the "A" button to turn the LMPL20 on. A Startup Screen will initially appear on the LCD with manufacturer name and user information, if entered, for approximately 3 second. If you press and hold the "A" button, the Startup Screen will remain on the LCD until the button is released. The Main Screen will appear after the Startup Screen (**Fig. 4 on Remote it is Fig. 16**). The Plumb LED turns on when the LMPL20 is turned on.

Allow the 60 seconds for the LMPL20 to self-level after entering the Main Screen. While the LMPL20 is leveling, the laser will blink ON and OFF at a one second rate. Once the LMPL20 is level, the laser will turn on according to the selected laser power mode. The LMPL20 will automatically re-level if it is moved from its level position. The Level Bubble Icon on the main screen indicates when the cross-axis is level.

Note:The LMPL20 is remote capable with the RC20 remote.

Note: Signal Strength is only displayed after receiving signals from the LMPL20.

REMOTE: The Main Screen of the Remote Control works in the same manner as the Main Screen of the LMPL20, and has the same features displayed with the exception of.

Signal Strength - Display's the Signal Strength level of the Remote Control

Sleep Mode- Conserves battery power by turning the LCD and laser beam off. When sleep mode is turned off the LCD will re-illuminate and Laser beam will become visible again with out losing previous settings.

Note: Sleep Mode function is only available using the remote.

Sleep Mode

Once the remote is on hold the power button for two seconds to select sleep mode. Then press the enter button to activate sleep mode. Deactivate sleep mode using the same procedure, hold power button and then press enter button.

Re-Leveling

If the LMPL20 is moved from its level position, the LMPL20 will re-level. The leveling feature of the laser is independent of the Grade and Line Position Settings.

Plumb

1. On a flat horizontal surface place the LMPL20 in its normal operation position.
2. The LMPL20 has a Plumb LED located at the top of the LMPL20 (**See Figure 2 #9**). This led is always on when the LMPL20 is powered on.

Grade

The Main Screen displays the selected grade. The LMPL20 has a grade range capability of +40% to -15%. A grade setting of zero places the laser output at a level position. Grade can be entered in the following ways from the Main Screen: (**see Fig. 3**)

1. Rolling Grade – either pressing the “E1” button or the “E2” button directly enters grade. Pressing and releasing either button will increment or decrement the grade setting by one. Press and holding either button will gradually increase the speed at which the grade is incremented or decremented.
2. Direct Entry Grade – Pressing the “C” button will select Direct Entry Grade. Once the button is pressed, the most significant grade number will be highlighted, indicating that the “E1” or “E2” button will either increment or decrement the selected digit. Pressing the “D1” or “D2” button will allow selecting the other grade digits. The selected grade will not take effect until either the “C” button is press again, or 5 seconds have passed without a button being pressed.
3. Auto Grade Zero – Pressing the “E1” and “E2” buttons at the same time implements this function. When both buttons are pressed at the same time, the LMPL20 will go to a zero grade setting.

REMOTE: Grade can be entered in the same manner by using the RC20 Remote Control. (**See Fig. 15**)

Note: If the Lock has been turned on, Grade adjustments cannot be made.

Line Position

(**See Fig. 3**)

The LMPL20 's laser line position can be adjusted $\pm 15\%$ from center. The Line Position can be adjusted from the Main Screen by pressing the “D1” or the “D2” buttons. Pressing and releasing either button will make a small adjustment. Pressing and holding either button will gradually increase the speed at which the line position is adjusted. Pressing the “D1” or the “D2” buttons at the same time implements the Auto Line Position Function, which positions the line position back to center. The Line Position Icon on the Main Screen indicates the current position of the laser line. Press and hold both D1 and D2 buttons for three seconds to center the line control.

REMOTE: Line Position can be entered in the same manner by using the RC20 Remote Control.

Note: When adjusting line position, the remote will communicate to the Pipe Laser with both RF and Infrared for buried pipe applications.

Note: If the Lock has been turned on, Line Position adjustments cannot be made.

Lock

The Lock feature allows disabling grade and line position adjustments. Pressing the “F” button toggles the lock between ON and OFF. The Lock Icon on the Main Screen indicates whether the Lock is ON or OFF.

REMOTE: Lock can be turned ON or OFF in the same manner by using the RC20 Remote Control

Menu

The LMPL20 uses a menu based system for unit options and settings.

1. Select Menu Display Screen (**Fig. 5**) by pressing the “**B**” button.
2. Press “**D**” or “**E**” buttons to choose options.
3. Press “**C**” button to select a menu item.

The Menu Display Screen will appear on the LCD Display (**See Figure 5**). The Menu Display Screen lists the following configuration setting options:

- a. Laser Power Option– Used to adjust laser power and enable/disable fast blink mode.
- b. Unit Option Screen – Used to select grade display in Percent or Percent Permilli.
- c. Text Entry Screen – Used to set user information that is displayed on the Start Up Screen.
- d. Security Option – Used to set a User Password and lock LMPL20 options.
- e. XY Calibration Screen– Used to Electronically calibrate level for either the X or Y axis of the LMPL20.
- f. Remote Communication Address Select Screen – Used to set LMPL20 address for use with remote.
- g. Selected icon description (Language specific to the language set by your local dealer)

Note: An Arrow will indicate the current selected Menu Option. A Lock Icon will also display with the current selected Menu Option which indicates whether the Menu Option is enabled or disabled. See the Security Screen section.

REMOTE: The Menu screen of the Remote Control (**See Fig. 18**) works in the same manner as the Main Screen of the LMPL20, and has all the same features displayed including:

Remote Location Option (Front or rear operation)- Used to adjust Main Grade Display Screen with regard to working point of view.

The Remote Control has an adjustable location display feature. This feature is used to set the Line Position display on the Remote Control to match the working location of the user. The Line Position will display an arrow indicator icon (**see Figure 20**) to display the current line position. Setting the Remote Location will match the Line Position arrow so that it points in the same direction as the laser, regardless of the users working point of view.

The Remote Location Option has two settings.

- a. Behind Pipe Laser – The Remote Control display’s Line Position at the top of the Main Grade Display Screen, with the arrow pointing in the direction of the laser (Pointed away from user).
 - b. In Front of Pipe Laser – The Remote Control display’s Line Position at the bottom of the Main Grade Display Screen, with the arrow pointing in the direction of the laser (Pointed towards user). The Line Position display will move in the opposite direction as the Behind Pipe Laser setting.
1. In the Menu Display Screen select Remote Location Option (**Fig. 18 d**) and press the “**C**” button.
 2. The Remote Location Screen will appear in the LCD display.
 3. Press the “**E**” buttons to select options.
 4. Press the “**B**” to exit and save option

Line Alert

The LMPL20 Line Alert feature alerts the user that the laser line may have changed position (in line setting and or elevation) if the pipe laser tool was disturbed.

When the pipe laser tool is turned on, it will default to the last setting selected for Line Alert. The default setting for Line Alert is user selectable. The default setting may be set to Line Alert ON or Line Alert OFF. To select the default setting for Line Alert, press the “**B**” button to select the Menu Display Screen. Pressing the “**B**” button again within 3 seconds will display the Line Alert Screen. Pressing the “**C**” button will toggle

between Line Alert ON and Line Alert OFF. To return to the Main Display Screen, press the “**B**” button.

When Line Alert ON is selected, the Line Alert feature will become active after the pipe laser tool is level for 30 seconds. If the pipe laser tool is disturbed after 30 seconds, Line Alert will trigger. The pipe laser tool will stop leveling and the laser beam will repetitively blink two times in one second with a one second pause before blinking again. It is necessary to check any benchmarks that have been made to ensure the setup has not changed. Pressing the “**C**” button will acknowledge the alert and return to the Main Display Screen and normal operation.

Laser Power Screen

The Laser Power Screen allows the user to adjust the power out put to maximize laser visibility. The setting range is from one through nine, and an optional pulse mode.

The Laser Power Screen (**See Figure 8**) has two options, below.

- a. Laser Power – Increase/Decrease Laser Power
- b. Fast Blink – Puts the laser in Full Power, but blinks the laser at a variable rate.

Note: Fast Blink does not blink at the same rate as the laser blinks during self-leveling.

1. Select Laser Power Option by pressing the “**D**” buttons.
2. Increase or decrease the value of the laser power by pressing the “**E**” buttons.
3. Once the Laser Power is selected, press the “**B**” to return to the Menu Display Screen

Unit Option Screen

The Unit Option Screen allows user to change from permil to percent units on the display screen. (Which moves the decimal point on the grade display one position from Right to left.)

The Unit Option Screen (**See Figure 10**) has two options, below.

- a. Percent – Displays Grade Value in Percent (Example: +10.000%)
- b. Permil - Displays Grade Value in Permil (Example: +100.00‰)

1. Select Percent or Permil by pressing the “**D**” or “**E**” buttons.
- 2.. Press the “**C**” button to choose selected unit.
3. Once the unit is selected, press the “**B**” to return to the Menu Display Screen

Text Entry Screen

The LMPL20 offers the user the option to input up to four lines of text for displaying user information. This can include, but is not limited to, the following:

- a. Name
- b. Address
- c. Phone Number

Note: If the User has set up a password, then the LMPL20 will request the user enter a password before entering the Text Entry Screen. If there is no set password, then the LMPL20 will enter the Text Entry Screen directly.

On the Text Entry Screen (**See Figure 6**), the available text are located on the bottom of the screen. The top of the screen displays the current User Information. The User Information is split across 4 rows, by 16 character locations. If there is no User Information in a given character location, then it will display with an underscore icon. Underscore icons are automatically replaced with blank spaces on the Start Up Screen.

1. Press the “**D**” buttons to select the desired character on the bottom of the Text Entry Screen
2. Only 12 characters can be displayed on the screen at one time. Press the “**E**” buttons to display the next twelve characters.

3. Press the “**C**” button to enter the selected character into the current selected location on the top of the screen. Selected location will automatically increment to the next location.
4. To select location of characters on the top side of the screen press the “**D**” button to choose the up, down, left, and right arrows at the bottom of the screen.
5. Press the “**C**” button with left, right, up, or down arrows selected to move character location in that direction.
6. The Underscore symbol will enter blank spaces.
7. Once all characters are set as desired press the “**B**” button to return to the Menu Display screen.

The LMPL20 will automatically save the text Entry in memory. The Text Entry will now display on the Start Up Screen after first turning on the LMPL20.

Security Screen

(See Fig. 5)

The LMPL20 offers the user to enable or disable different functions in the Menu Display Screen.

1. In the Menu Display Screen select the Security Option (**Fig. 14**) and press the “**C**” button.
2. The Security Screen will appear in the LCD display (**Fig. 12**)

Note: If the User has previously set up a password, then the LMPL20 will request the user to enter a password before entering the Security Screen. If the Password is input incorrectly, it will clear and request the password again. By hitting the “**B**” Button, the LMPL20 will return to the Menu Display Screen.

The Security Screen has three options:

- a. Change – Used to change the current Security Password
- b. Reset – Used to clear the current Security Password to its default value
- c. Security – Used to enable/disable menu options.

1. Use the “**E**” Buttons to select which option to choose.
2. Select Change by pressing the “**C**” Button to input a new or different password. See the Password Entry Screen section for details.
3. Select Reset by pressing the “**C**” Button to delete the current user password
4. Select Security by pressing the “**C**” Button to open the Security Menu Screen.

Note: The Security Menu Screen looks identical the the Menu Display Screen, except that it cannot be used to enter Menu Functions.

In the Security Menu Screen, the User can enable or disable options in in the Menu Display Screen. This is used to prevent access to any disabled options if the User does not have the Password.

1. Select the Menu Option to edit by pressing the “**D**” and “**E**” buttons.
2. Press the “**F**” Button to Enable/Disable the selected option.
3. A Lock Icon will appear next to the selected option. The Lock will be displayed locked if the option is disabled and will appear unlocked if the option is enabled.

Note: The User does not have the ability to lock out the Security Option. This is to prevent the User from accidentally locking themselves out and being unable to change any of the settings.

Remote Communication Address Select Screen

The LMPL20 offers the user the ability to set the LMPL20 and the RC20 control to a specific address.

This is used in applications that involve multiple LMPL20's and is used so the one remote will only work with the LMPL20 that is set to the same address. Using different addresses will prevent cross talk between Instruments.

1. It will take several seconds before the set address is displayed.

Note: The wait screen will display while remote reads the current address.

2. The Remote Address Option Screen will appear in the LCD display (**Fig. 9**).
3. Press the "E" buttons to adjust the address from 0 to 254.
4. Press the "C" button to set the address to the desired value. The selected address will blank out while the address ions being changed. Once the changed the set address will be displayed.
5. Press the "B" button to exit back to Menu Display screen

Note: If address 255 is displayed, an Error occurred when setting the address. Reset the remote communication address.

POWER SUPPLY OPTIONS

The LMPL20 uses two different types of battery back:

1. 4 D-Cell Alkaline Battery Pack
2. Rechargeable NiMH Battery Pack

Alkaline Battery Pack

1. To Remove Battery Pack

Remove the Battery Pack from the LMPL20 by turning the Lock Knob on the top of the battery pack and removing it from the housing. (**See Figure 23-1**).

2. To replace the Alkaline Batteries

Remove the top portion of the battery pack by lifting the two locking tabs on either side of the battery pack casing (**See Figure 23-2**).

Once the battery pack is open, remove depleted batteries and insert fully charged 4 D-Cell Alkaline batteries as shown in (**Figure 23-3**).

DO NOT mix batteries, use only like batteries.

DO NOT use new batteries with old batteries.

Place the top of the battery pack back onto the bottom of the battery pack, and lock the two locking tabs on both sides.

Rechargeable NiMH Battery Pack

1. To Remove NiMH Battery Pack

Remove the Battery Pack from the LMPL20 by turning the Lock Knob on the top of the battery pack and removing it from the housing .

2. To Charge NiMH Battery Pack External to LMPL20

Plug battery charger into suitable wall outlet.

Insert charge plug of battery charger into NiMH Battery charge port (**See Figure 24**).

The NiMH Battery will take (8-10) hours to fully charge.

It is recommended that the NiMH be fully charged prior to use.

3. To Charge NiMH Battery Pack Internal to LMPL20

With a NiMHbattery pack installed plug a 12 V power supply into the external 12V power port located in the front of the LMPL20. The 12V supply will then charge the NiMH battery pack during LMPL20 operation and when the instrument is turned off.

External 12V Power Port

The external power port is located on the front of the instrument, below the button pad and LCD Display (See Figure 1 #6).

The external power port may be used to supply the LMPL20 with an external 12V power supply. The external 12V power supply can be used to power the LMPL20 without a battery pack installed, or can be used to charge a NiMH rechargeable battery pack if inserted in the LMPL20. If a battery pack containing Alkaline non-rechargeable batteries is inserted in the LMPL20, the 12V supply may still be used without damaging the batteries or the LMPL20.

Using an external 12 volt DC battery source (Vehicle battery)

1. Turn the vehicle engine off.
2. Make sure to connect the red clip to positive terminal and Black clip to negative terminal.
3. Connect to External Port

Note: Always turn the LMPL20 off before removing external power cable.

MAINTENANCE AND CARE

DO NOT store LMPL20 in cold environment. Moisture can form on interior parts when warming up. This may cause laser windows to fog and corrosion to internal circuit boards.

DO NOT use aggressive cleaning agents or solvents to clean LMPL20.

REMOVE moisture or dirt from laser windows with a soft, dry cloth.

SPECIFICATIONS

Description	59-LMPL20
Beam Type	Red 635nm
Auto Line Centering	Yes
Auto Grade Zeroing	Yes
Plumb Reference	LED
Remote Control	Yes
Remote Control Range F/B	800ft/200ft 245m/60m
Grade Range	-15% to +40%
Line Range	Left / Right 15ft @ 100ft
Self Leveling Range	Grade Axis: -15% to +40%, Cross Axis: $\pm 5^\circ$
Horizontal Accuracy	$\pm 10''$ (Arc Seconds)
Power Source	NiMH Rechargeable battery pack
Optional Power Source	4 D-Size Alkaline
External Power Source	12vDC
Estimated Battery Life - NiMH:	40 hours
Estimated Battery Life - Alkaline:	60 hours
Housing Construction	Cast Aluminum
Operating Temperature	-4°F to +122°F
Water	waterproof
Nitrogen Purged	Yes
Dimensions (LxDia.)	15.5" x 5.0"
Warranty	2 Years

LEVEL ACCURACY CHECK

Setting two benchmarks

Locate a previously level area to set the LMPL20. Level the LMPL20 and set the grade to precisely 0.000% Set two markers (A and B) in line with the laser. Marker "A" should be set 1' (.3M) from front of the LMPL20, and Marker "B" should be set 100' (30M) away. (Fig. 32)

Level Check

- A. Set a measuring rod directly on top of marker "A". Mark where the beam strikes the measuring rod "A1"
- B. Set the same measuring rod directly on marker "B" and mark this point "B1" (Fig. 33)
- C. Move the LMPL20 to the opposite side of the markers so that it is located 1' from marker "B" and 100' away from marker "A". (Fig. 34)
- D. Make sure that the laser beam strikes mark "B1" when the measuring rod is placed on marker "B". If needed adjust the height of the LMPL 20 so that the laser strikes "B1" (Fig. 34)
- E. Now set the measuring rod on marker "A" and if the laser beam strikes mark "A1" the LMPL20 is calibrated. If the laser beam did not strike mark "A1" then the unit needs to be calibrated.

X AXIS CROSS LEVEL CHECK

The LMPL20 offers the option to check and adjust the Calibration of the Horizontal Line Position.

Select XY Calibration from the Menu Display Screen and press the "C" Button.

1. Place the Pipe laser (50) feet from the pole. (See Fig. 35).
2. Turn on the LMPL20 and allow it to self level.
3. Verify that the Line Position is set to the default center position. Point the laser at the Pole and mark the center of the laser on the Pole.
4. Adjust the Line Position to its maximum right Line Position setting by pressing the "D2" Button. (See Fig. 36).
5. Turn the LMPL20 so that the laser is pointing at the Pole (See Fig. 37). Allow the LMPL20 to self level.
6. Compare the laser height of the current maximum right setting to the center mark that was previously recorded. If they are level with each other, no adjustments need to be made. If they are not level, follow X axis calibration procedure (see page 16).
7. Once the right side has been completed, adjust the line position to its maximum left Line Position setting by pressing the "D1" button. (See Fig. 38).
8. Turn the LMPL20 so that the laser is pointing at the Pole (See Fig. 39). Allow the LMPL20 to self level.
9. Compare the laser height of the current maximum left setting to the center mark that was previously recorded. If they are level with each other, no adjustments need to be made. If they are not level, follow X axis calibration procedure (see page 16).
10. Power off the LMPL20 by pressing the "A" button. Center the LMPL20 and turn it on. Allow it to self level.
11. Repeat the calibration procedure to verify the previous adjustments are correct. Repeat as needed.

PL20 Pipe Laser Calibration Procedure

XY Calibration Screen

The LMPL20 offers the user the ability to recalibrate.

1. In the Menu Display Screen select XY Calibration Option (**Fig. 5 e**) and press the “**C**” button.
2. The XY Calibration Option Screen will appear in the LCD display (**Fig. 7**).

Y Axis (Grade Axis)

Check calibration as outlined in the calibration or peg test (**see Figures 32 –34**).

If unit is out of calibration then do the following:

1. Center the line adjustment by pressing left and right adjustment arrows.
2. Zero the grade counter.
3. In the Menu Display Screen select XY Calibration Option (**Fig. 5 e**) and press the “**C**” button.
4. Press the Lock key (**Fig. F**) to enter the Y axis adjustment screen.
5. Using the up(**E1**) and down (**E2**) buttons change the laser grade setting (this adjusts the beam without changing the counter) to the correct elevation.

Note: With the laser beam set all the way to the left (**E1**) makes the beam go up and (**E2**) makes the beam go down. With the laser beam set all the way to the right it is opposite. (**E1**) makes the beam go down and (**E2**) makes the beam go up.

6. Press menu button to accept changes.
7. Recheck Y axis calibration.

X Axis (Cross Axis)

Check the cross axis calibration as outlined in the calibration procedure (**see figures 35-39**).

1. Center the line adjustment by pressing left and right adjustment arrows.
2. Zero the grade counter.
3. Move the laser spot line adjustment to right or left extreme and check elevation. If incorrect then follow steps below.
4. In the Menu Display Screen select XY Calibration Option (**Fig. 5 e**) and press the “**C**” button.
5. Using the up and down arrows change the laser grade setting (this adjusts the beam without changing the counter) to the correct elevation.
6. Press menu button to accept changes.
7. Move the laser spot line adjustment to opposite side and repeat the adjustment process.
8. Recheck X axis calibration.

APPLICATIONS

Setting LM-PL20 (All models)

Set Up of the Laser at the Correct Elevation (HI)

All height references are given in relationship to the Invert Elevation (inside lowest point of pipe).

1. Attach the LM-PL20 to the trivet plate or position in the manhole on the correct feet. Care should be taken that the LMPL20 is positioned on the correct centerline.
2. Use the three leveling screws to adjust the trivet plate to approximate level condition (not required when mounting on self centering feet with pre-poured inverts - as the invert should be at the correct elevation).

3. Where pre-poured inverts are used be sure to attach the correct feet size and set the laser in the center of the invert (**Fig. 26**).
4. Use an optical level or rotating laser level to obtain the elevation from the elevation rod or (**See Fig. 26**)
5. Add the cut amount obtained from the stake to the elevation obtained by the optical level or laser.
6. This dimension is the distance from the optical level or laser to the invert of the pipeline - so subtract the distance from the invert to the center of the laser spot.
7. Place the grade rod in the manhole at the correct elevation and position the laser at the correct height in relation to the grade rod.
8. Note that the grade rod can be positioned on the top of the LMPL20 and a correction of - 2.78 inch (70.5mm) is required.

How To Set The Grade

To set grade follow procedures as described in section “**Grade**” page 8.

How To Establish and Set Line or Direction

Procedure 1 (Fig. 27)

1. Set the LTU or Transit over the centerline of the pipe using a plumb bob and offset measurement.
2. Position the sighting scope of the transit so that the vertical crosshair is aligned to the next manhole position of line stake.
3. Plunge the sighting scope into the area where the laser is set up and position the laser pivot or alignment crosshair point.
4. Bring up the scope so that the vertical crosshair is in the position of the open trench in front of the laser where the laser spot will project.
5. Using the remote control RC20 drive the line adjustment left or right until the laser spot is in line with the vertical crosshair in the scope.
6. The laser housing and the laser spot in front of the laser are now aligned with the axis of the pipeline stakes and pipe laying can begin.

Procedure 2 (Fig. 28)

1. Mount the Manhole Mount Transit Tower (optional) to the manhole and position the optical instrument or transit directly over the centerline of the pipeline.
2. Drop a plumb bob down from the optical instrument and position the pipe laser at the pivot point directly under the plumb bob.
3. Align the optical instrument by the vertical crosshair to the next manhole position stake.
4. After locking the horizontal rotation, plunge the scope into the trench at a convenient spot to view the laser spot.
5. Using the remote control RC20 drive the left or right direction control until the laser spot is aligned with the crosshair in the optical instrument.
6. The LMPL20 is aligned with the pipeline axis and pipe laying can begin.

Procedure 3 (LMPL20)

1. Position the LMPL20 exactly in the center of a poured invert or centerline marked on the bottom of the manhole so that the pivot point is on the centerline.
2. Attach the loose end of a plumb bob cord to the notch on the LMPL20 at the pivot point.
3. Extend this cord to the top of the manhole and so that the cord is supported over the thumb of the operator. The free end with the plumb bob then hangs from the thumb of the operator.
4. Using the cord from the thumb to the plumb bob as a guide move the thumb left or right until both sides of the cord are vertical and aligned with the next manhole stake.
5. Using the remote control RC20 drive the left or right direction control until the laser spot is aligned with the both of the vertical cords.
6. The LMPL20 is aligned with the pipeline axis and pipe laying can begin.

Setting Excavation, Base Material and Pipe Elevation (Fig. 29)

1. To accurately set the base elevation for pipe laser use, you must be able to calculate the base elevation from the center of the pipe laser beam.

Using the sample information below, you will be able to calculate your base elevation as described above.

- Consider a pipe diameter of 12" (300mm)
- Use a pipe thickness of 1" (25mm)
- Consider a base material thickness of 6" (150mm)

Example:

To calculate the base elevation, take the pipe radius 12" divided by 2 = 6" (300mm/2 = 150mm)

Next using the pipe thickness and the base material (1" or 25mm) and (6" or 150mm) respectively

Calculate the distance from beam to base elevation as follows

Pipe Radius + Pipe Thickness + Base Material Thickness = Base Elevation

6" + 1" + 6" = 13" or 150mm + 25mm + 150mm = 325mm

2. You may now utilize any leveling rod, direct elevation rod or grade stick and the pipe laser beam to control the excavation depth by marking a reference point on your rod at the height detailed above, (13" or 325mm). Utilize the beam control of the LM-PL20 to match up to the marks on the grade stick or level rod.
3. In some cases, it may be necessary to set a sub base elevation to begin work. To set a sub-base elevation, calculate the distance from the center of the beam as follows:

Example:

To calculate the sub-base, utilize the information below.

Pipe Diameter: 12" (300mm) as detailed in the example above

Pipe thickness: 1" (25mm) as detailed in the example above

Distance from beam to sub base elevation

To calculate the first step, take the pipe radius 12" divided by 2 = 6" (300mm/2 = 150mm)

Next using the pipe thickness and the base material (1" or 25mm) and (6" or 150mm) respectively

Calculate the sub-base elevation as follows

Pipe Radius + Pipe Thickness = Sub-Base Elevation

6" + 1" = 7" or 150mm + 25mm = 175mm

4. You may now utilize any leveling rod, direct elevation rod or grade stick and the pipe laser beam to control the elevation of the sub-base material by marking a reference point on your rod at the height detailed above, (7" or 175mm).
5. Finally to set the LMPL20 to the correct elevation for use, place the pipe target in the pipe using the target associated with the size of pipe you are setting. Then adjust the pipe until the laser beam is precisely in the center of the alignment center of the target. Ensure that the center of the beam is exactly in the center of the bulls-eye on the target. Once there, set the pipe and fill accordingly to maintain grade.

In-the-Pipe Set up. (Fig. 30)

Assuming that some pipe has already been installed or laid, the LM-PL20 Pipe Laser can easily be positioned inside the pipe for additional use.

1. Install the correct leg set for the pipe wishing to be installed
2. Place the pipe laser into the last section of pipe and ensure that the LMPL20 is positioned at the right rotation and direction. Review the steps to ensure level and direction.
3. Place the pipe target in the last section of pipe to install ensuring the target is also positioned so that it is level using the level vial on the target mount.
4. Using the included Remote Control or the LMPL20 keypad, guide the pipe laser beam so that it is in the center of the target. You may use the remote control from the position of the end target to guide the beam.

This will ensure accuracy in set up and allow one person to set the LMPL20 up for use. By using the LMPL20 keypad, it may be necessary to have a person at both the LMPL20 and target in order to guide the laser beam to the center of the target.

Refer to section of Preparing LMPL20 for use for additional set up information.

Grade Checking (Fig. 31)

In order to ensure that you are laying pipe at the correct grade, it may be necessary to check pipe grade to ensure that the laser has been set for the appropriate grade and line. This should be completed after approximately 25 to 50ft (8 to 15m) pipe has been installed.

1. Utilizing an Automatic Level or Level Transit, measure a reference elevation at starting point A. **(See Figure 31)**
2. Measure the elevation at ending point B with the level or level transit
3. Determine the elevation of pipe end point B in the same manner.
4. Using the standard Rise over Run X 100 calculation you can easily determine the grade.

Take $(A-B) = \text{Rise}$

Take Horizontal Distance = Run

$((A-B)/\text{Horizontal Distance}) \times 100$ and you will have the grade of the installed sections.

If your measured grade does not match the intended grade, please review your initial laser or target set up to ensure accurate LMPL20 set up.

WARRANTY

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Fig. 23

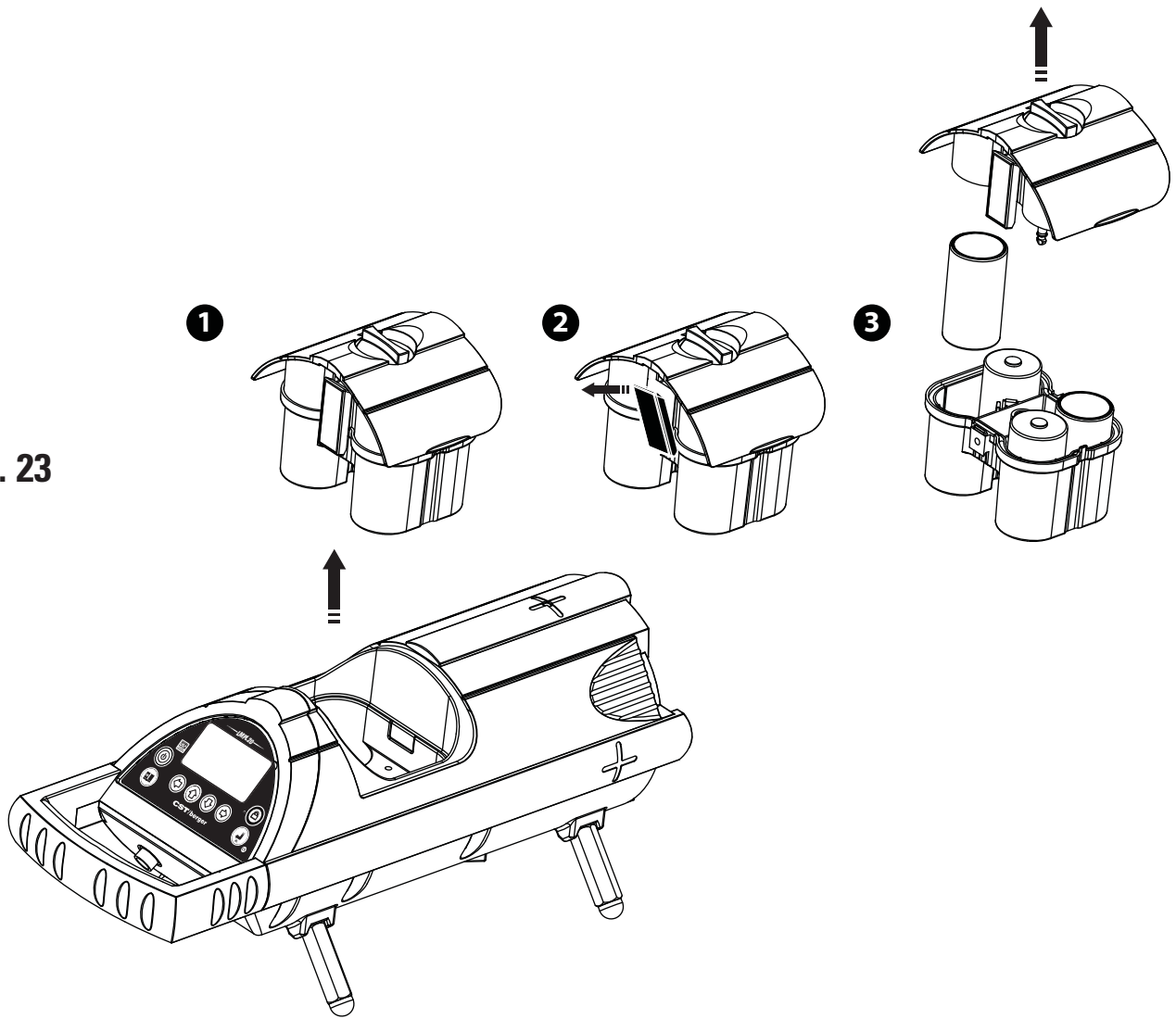


Fig. 24

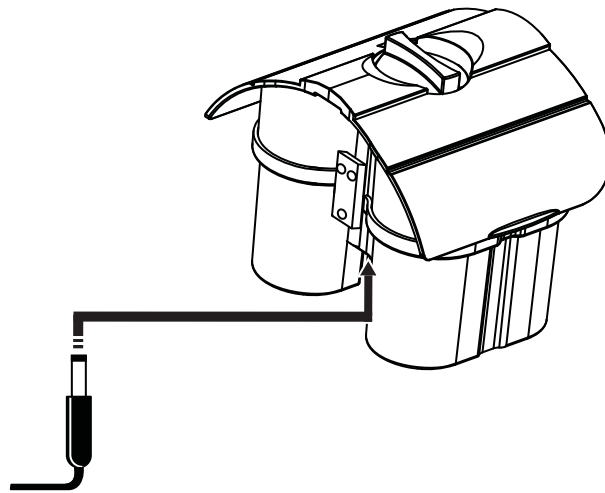


Fig. 25

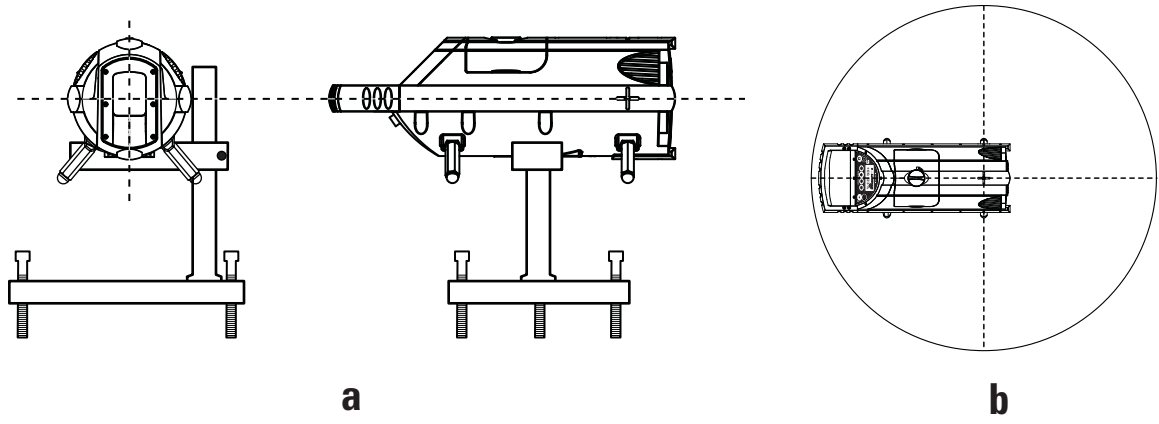


Fig. 26

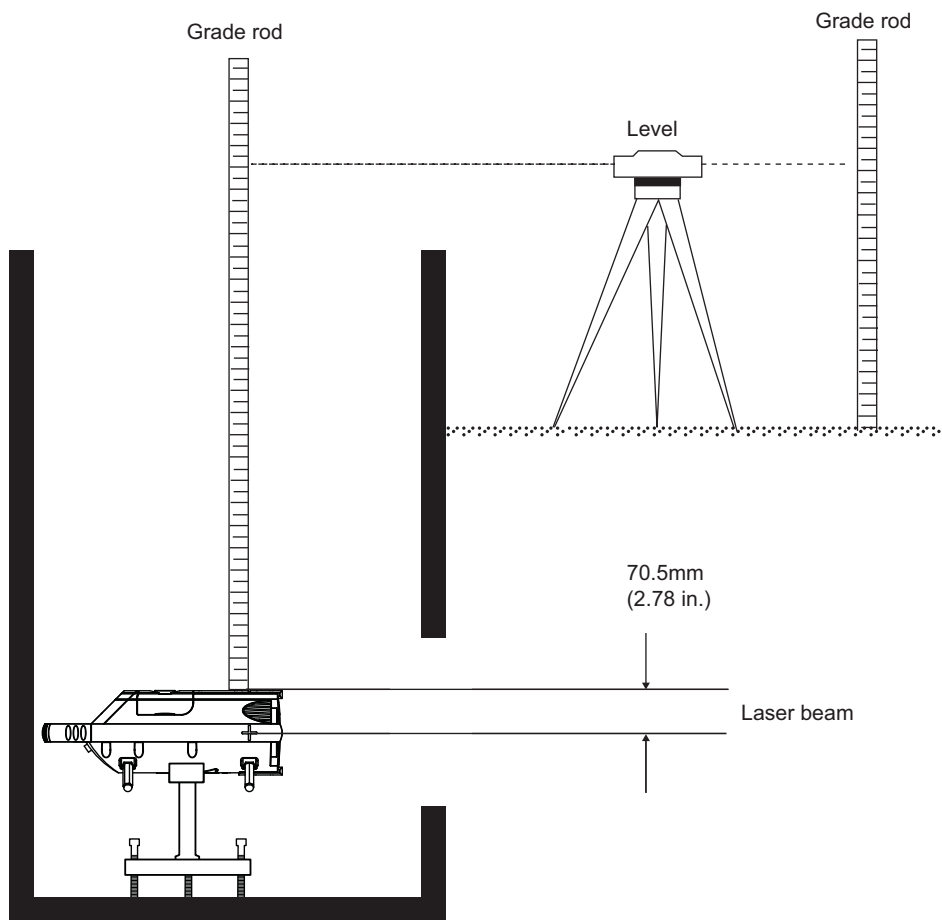


Fig. 27

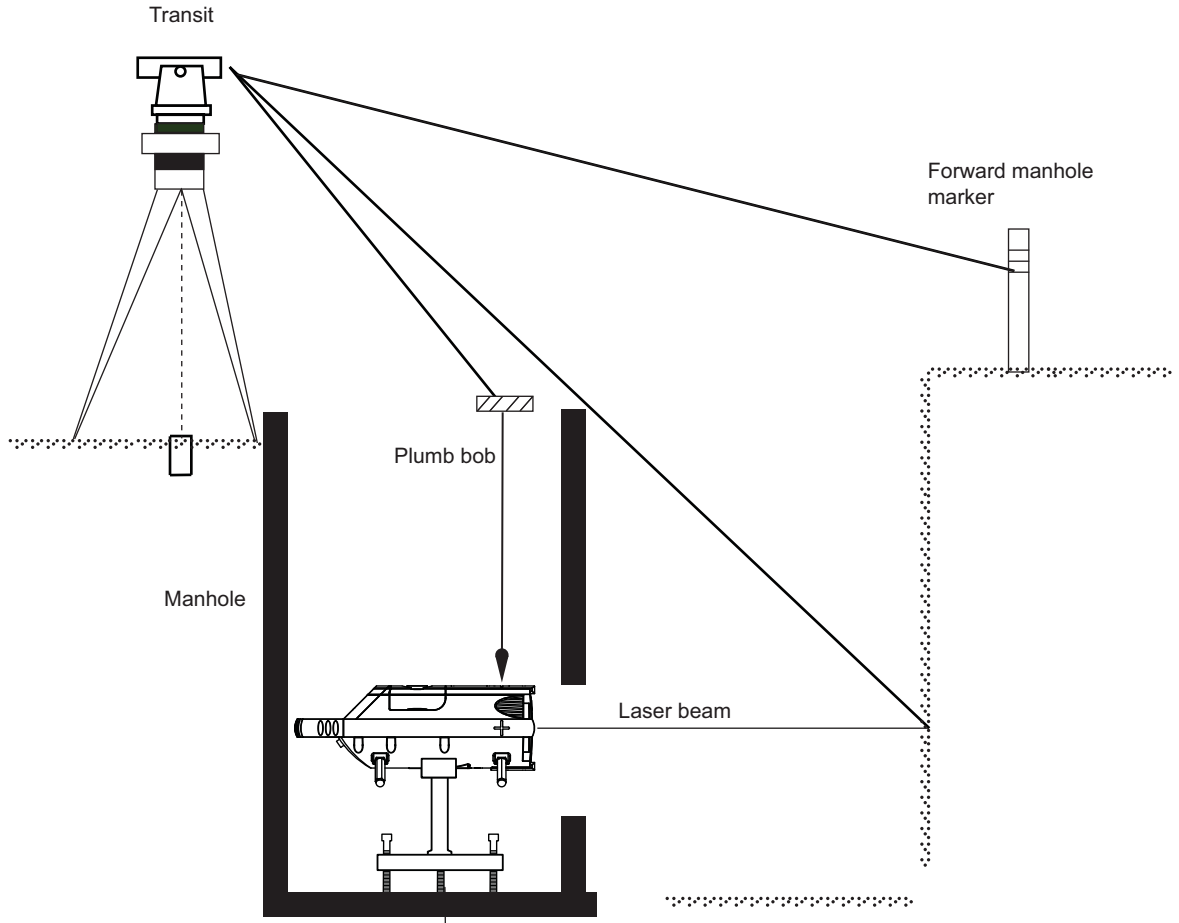


Fig. 28

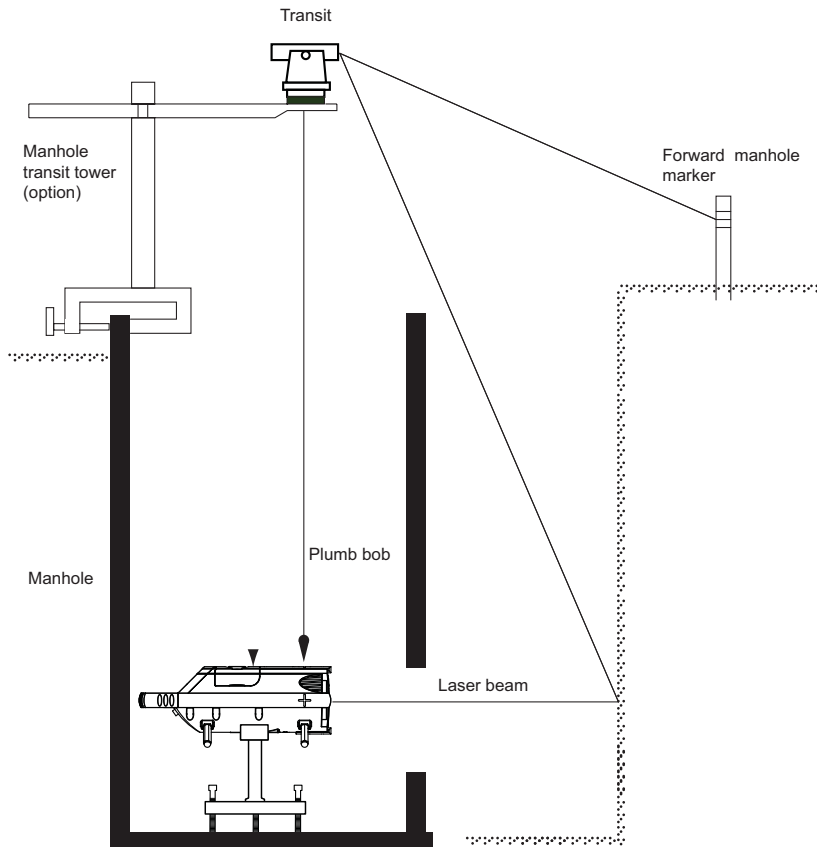


Fig.29

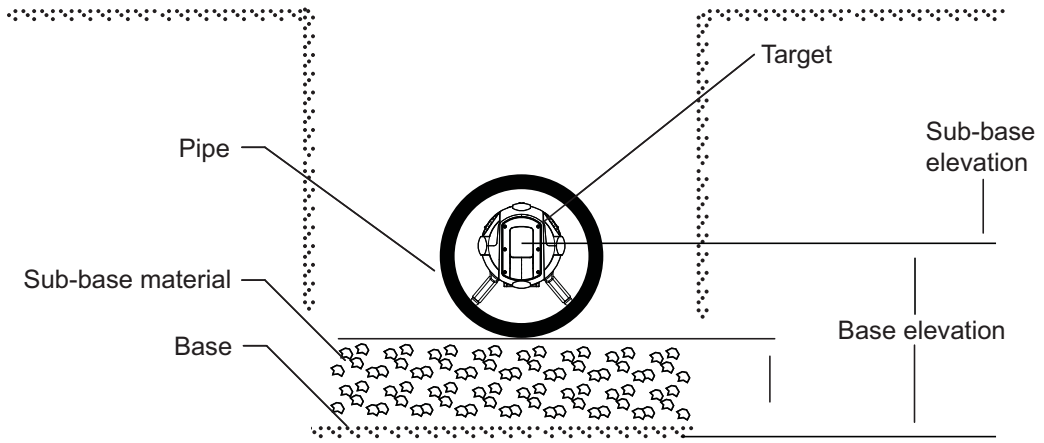


Fig. 30

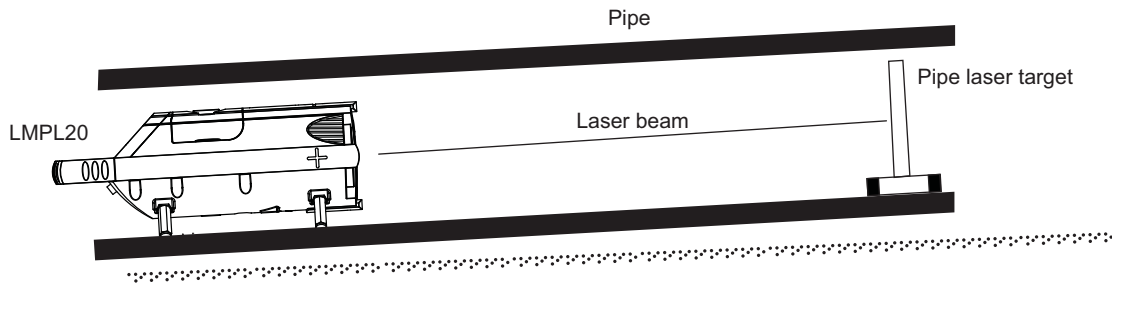


Fig. 31

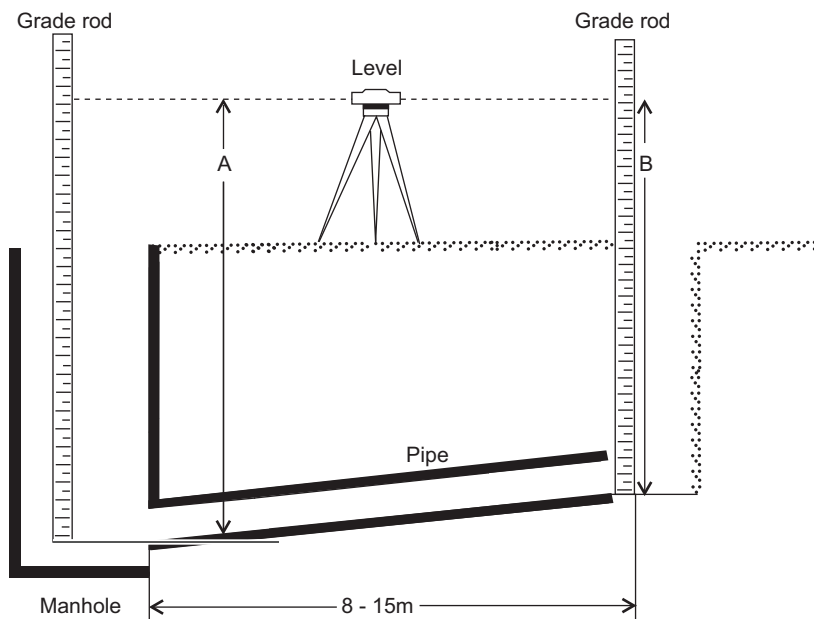


Fig. 32

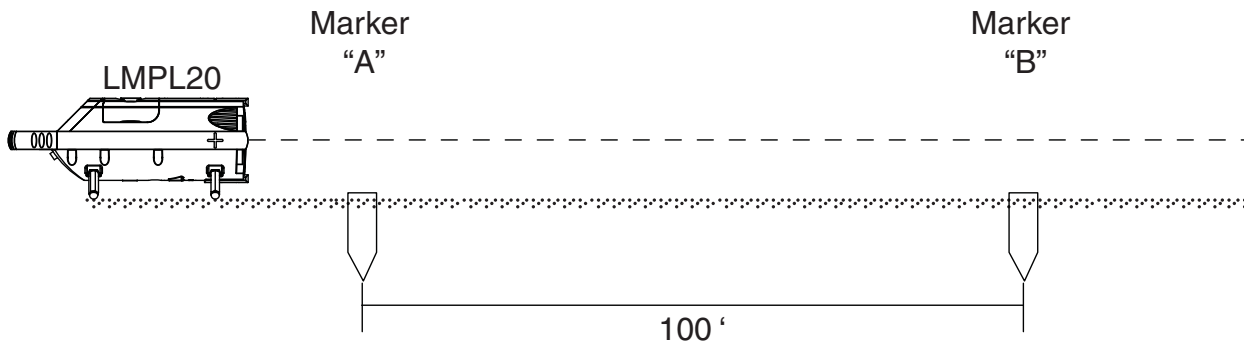


Fig. 33

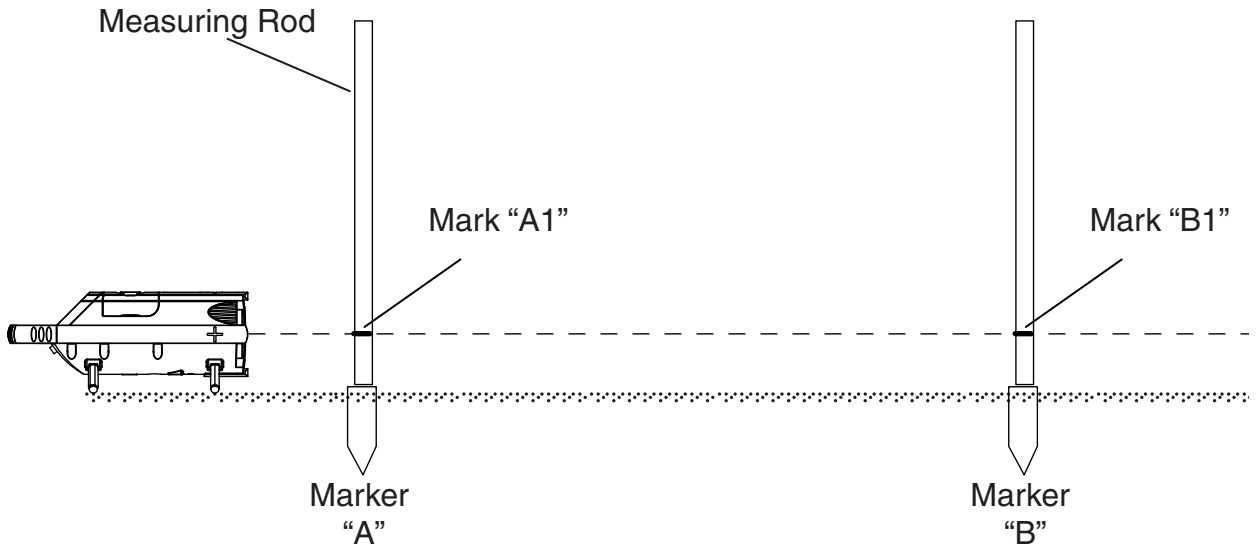
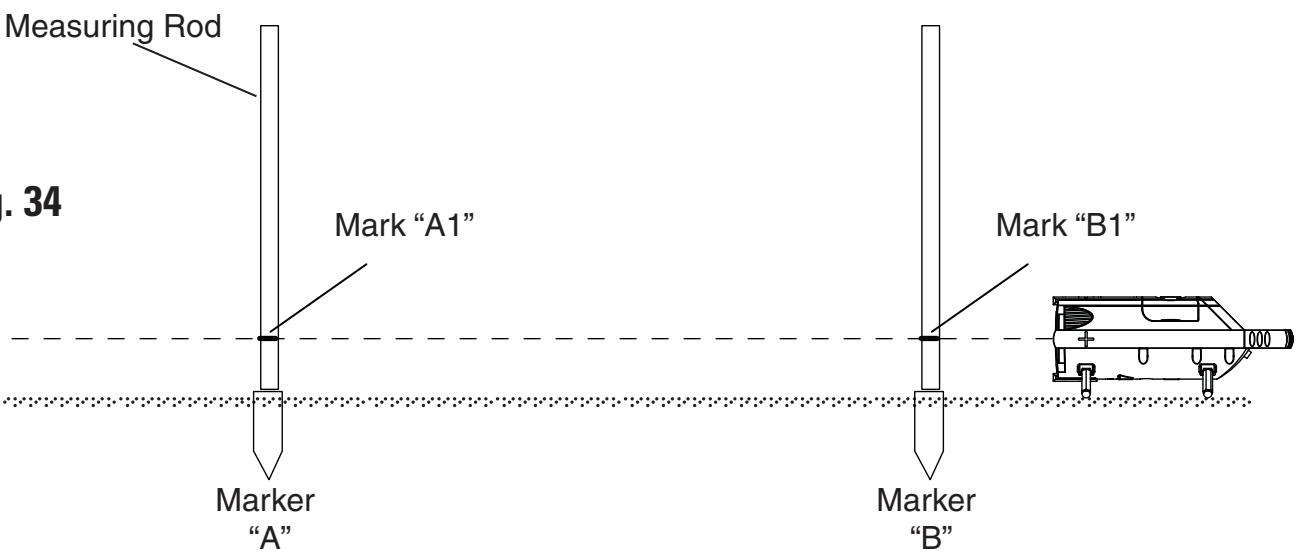


Fig. 34



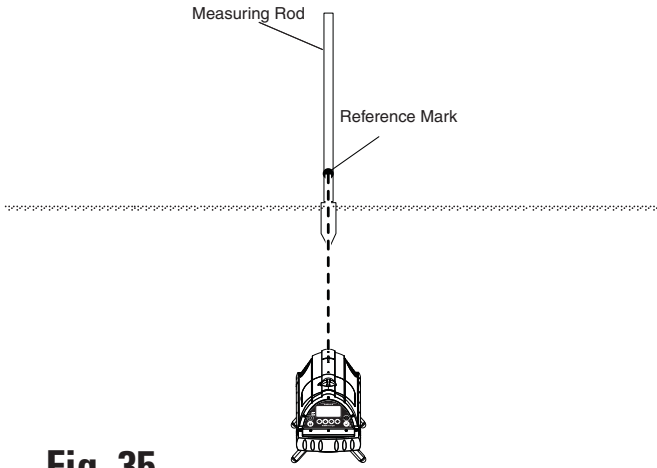


Fig. 35

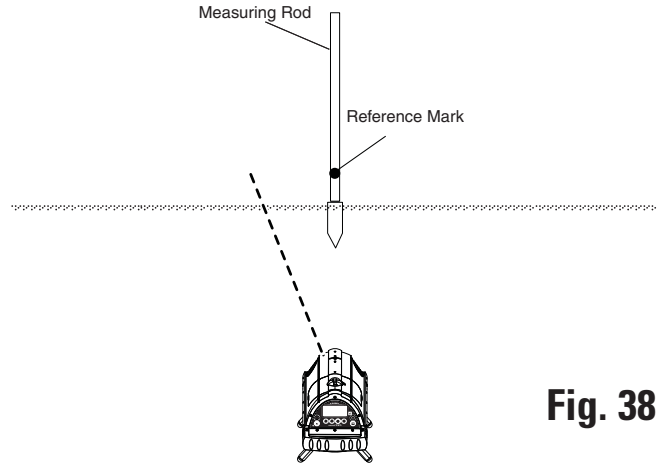


Fig. 38

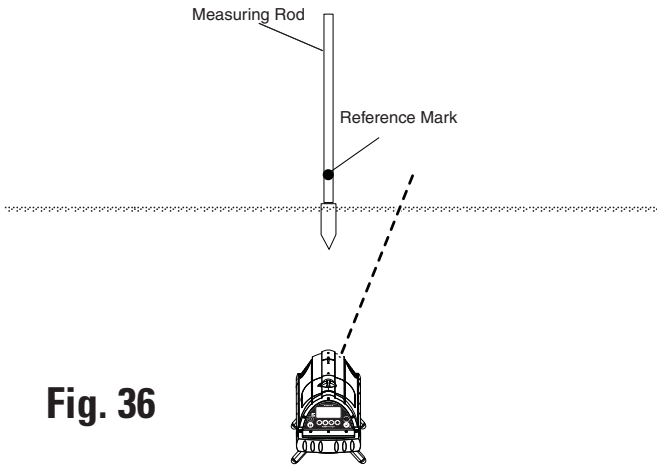


Fig. 36

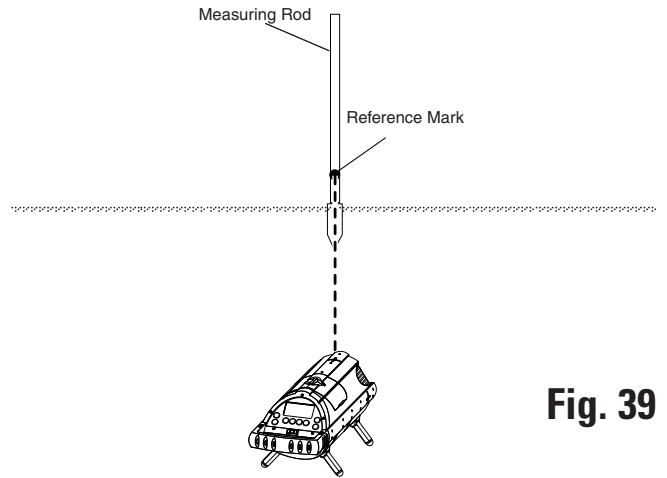


Fig. 39

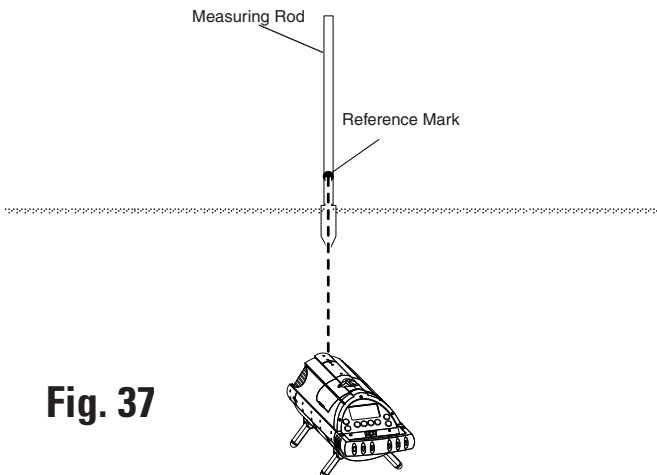


Fig. 37

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Robert Bosch GmbH

Power Tools Division, 70745 Leinfelden-Echterdingen, Germany

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